DOCUMENT RESUME

ED 214 782 SE 036 473

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TITLE 1981 Kuwait Summer Students Training Program, Secondary Component. An Evaluation Report.
INSTITUTION Kuwait Inst. for Scientific Research, Safat.
PUB DATE Jul 81
NOTE 17p.; Contains occasional light type.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Chemistry; Computer Science; Electronics; Foreign Countries; Physics; *Program Evaluation; Science Education; Secondary Education; *Secondary School Science; Secondary School Students; *Summer Science Programs
IDENTIFIERS *Kuwait

ABSTRACT

An eight-week summer science program was designed to create and encourage interest in science among outstanding secondary school students from different geographic areas of Kuwait. Opportunities were provided for students to: (1) engage in hands-on science activities; (2) work in laboratories in one of three research areas (chemistry; physics/electronics; and computer science); and (3) become familiar with science careers. In addition to these objectives, the first part of this report includes criteria for selecting and characteristics of participants, program activities, and a summary of program operations. Findings related to attainment of program objectives and program strengths/weaknesses are discussed in the second section and summarized in the third. Based on the results of questionnaires, formal/informal interviews, and staff impressions/observations, it was concluded that the program was successful in generating interest in science among the 40 participants. The major strength of the program was concluded to be its designed activities and organizational structure. Weaknesses included scheduling of selected activities, shortness of the 8-week program, need for mature supervisors, and quality of cafeteria food. Supporting data are provided in an appendix. (SK)

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1981 KUWAIT SUMMER STUDENT'S TRAINING PROGRAM

-- SECONDARY COMPONENT --

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An Evaluation Report

by

Ofelia Halasa, Ph.D.

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DIVISION OF TRAINING

KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH

July, 1981

SE 036 473

1981 SUMMER STUDENTS TRAINING PROGRAM

SECONDARY COMPONENT

AN EVALUATION REPORT

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1981 SUMMER STUDENTS' TRAINING PROGRAM

An Evaluation Report

I. INTRODUCTION

The Secondary Component of the 1981 Summer Students' Training Program (SSTP) represents joint efforts of Kuwait Institute for Scientific Research (KISR), Kuwait Foundation for the Advancement of Science (KFAS) and Kuwait University (KU) to generate interest in science at the high school level in Kuwait. The unique eight-week program focused on exposing of students to hands-on experiences with direct scientific laboratory procedures from high schools representing different geographical areas of Kuwait.

This report attempt to assess this program in relation to the following questions:

1. To what degree were the objectives attained?
2. What were the strength and weaknesses of the program?

A. Objectives

The goal of this program is to create and encourage interest in science among outstanding students to attain this goal, the following objectives were formulated by creating opportunities for direct experiences, working in real lab situations, and familiarizing them with science career opportunities.

1. Students will be provided with opportunities to work in laboratories in one of the three research areas: Chemistry, Physics/Electronics and Computer Science.
2. A total of twenty lectures and approximately twenty films on Physics and Chemistry will be an integral component of the program.
3. Participants will be provided with opportunities to visit KISR Research laboratories including Food Resources, Earth & Enviromental Sciences, Engineering and Petroleum.
4. Lectures on science-related topics will be provided Wednesday afternoons by KISR and KU scientists.

B. Criteria for program participation

The major criterion for program participation is to be judged "outstanding" based on the following:

- grades of B or better in science subjects
- teachers' recommendations

However, other factors were considered in the final selection of the 40 participants in order to equate for other important variable such as:

- geographical location of school
- grade levels: 3rd and 4th year
- nationality (Kuwaiti and Non-Kuwaiti)
- sex to allow balanced distribution of male and female students
- interview data

C. Program Operations (Participants N = 40)

The participants have the following characteristics:

- Twenty-four (60%) are Kuwaitis and 16 (40%) are Non-Kuwaitis. The 24 Kuwaiti participants represent 60% of 40 Kuwaitis who applied and the 16 Non-Kuwaiti students represented 7% of the 240 Non-Kuwaitis who applied.
- Of the 40 participants, 21 (53%) are boys and 19 (47%) are girls.
- Twenty-two (55%) will be third year students and 18 (45%) will be fourth year students in September 1981.
- About 40 (61%) out of 65 secondary schools in Kuwait were represented in the program.

The Progam activities consisted of the following:

- Participants attended regular Lectures on Physics, Chemistry and Computer Science.
- Participants spent three-hours (1:30 p.m. - 4:30 p.m.) three days/week for 8 weeks at their chosen research area:

- Physics and Electronics at Kuwait University

- Chemistry at Kuwait University

- Computer Science at KISR

. The number of participants in the three areas are noted below:

  - Fifteen (38%) in Physics and Electronics

  - Sixteen (40%) in Chemistry

  - Nine (22%) in Computer Science

. Participants attended three one-hour English classes weekly for eight weeks which focused on improving science-related English vocabulary and comprehension skills.

. Participants attended lectures on science-related topics by scientists which included the following topics: scientific approach, enconomics, pollution, future of solar energy, water resources etc.

. Different field trips were integrated into the program which included the following:

  - Telecommunication
  - International Airport
  - Failaka Island
  - TV-Radio Complex
  - Criminal Research Center
  - Mariculture & Fisheries Dept.
  - Centre of Agricultural Expt.

. Daily transportation to and from KISR were provided.

D. Summary of Operations

The 1981 SSTP program served a total of 40 students during the eight-week period 5/16/81 - 7/8/81. Estimated project cost was 20,000 Kuwait-dinars (KD) representing per student cost of 500 K.D. Breakdown of the approximate cost of 20,000 K.D. are noted below:

Item	Cost
Staff	13,000 K.D.
Students' stipend @ 10 K.D./week	3,200 K.D.
Transportation	2,200 K.D.
Miscellaneous	1,600 K.D.
TOTAL	20,000 K.D.

II. KEY EVALUATION FINDINGS

A. Attainment of Objectives

The 1981 Summer Students' Training Program for Secondary students was effective in generating interest in science among the forty participants, based on questionnaire responses, formal/informal student interviews and impressions/observations of staff. Approximately 4 out of every 10 (36%) responses alluded to the valuable experiences acquired from working in a real Chemistry and Physics laboratories at the University based on questionnaire responses. These experiences included the following: teamwork, learning about the importance of safety and the handling of equipments, the disappointments that usually accompany implementation of research projects. In addition, about 2 out of every 10 responses (23%) pointed out increase in knowledge as a result of the general lectures on the scientific approach, focusing on Physics and Chemistry.

Other key findings were noted:

1. Thirty-four (97%) out of 35 questionnaire respondents indicated that they retained their interest in the area of research that they selected to work in, during the eight-week program.

2. Among the top five highest rated program activities, two (research projects at KU and Films on Science) were directly related to science. The activities that received the top five high ratings are noted below:

English classes	4.82	Excellent
University Research projects	4.60	Excellent
Transportation	4.24	Very Good
Sports at the University	4.15	Very Good
Films on Science	3.91	Very Good

3. Six out of 7 scientific trips were rated at 4.0 or better, indicative of participants' very positive impressions about these trips. Although this activity received a high rating, participants pointed out that lack of efforts to integrate this activity with real learning experiences as a major shortcoming.

4. Participants' reactions to the Wednesday afternoon lectures showed marked variability, which may be a function of poor scheduling. Ratings are noted below:

Topics	Rating	
- Solar Energy	4.17	Very Good
- Islam & Science	4.06	Very Good
- Economics	2.39	Fair
- Scientific Approach	2.88	Average

5. The very positive impressions of participants about this program was confirmed by almost all participants (91%) who will reportedly recommend this program to their friends in the future.

6. Staff impression of participants' involvement in the program were very favorable. The reported that daily attendance was generally good; participation in classroom lectures was better than adequate; involvement with university projects showed better than average commitment.

Analysis of ratings of three groups of students (Physics/Electronics, Chemistry, and Computer Science) revealed no significant differences as noted below:

1. Student who selected Physics/Electronics and Chemistry laboratory projects tended to have almost identical choices. University projects, English classes and Transportation received the three highest ratings. Students in Computer Science significantly gave the lowest rating to the computer sessions. However this group gave two of its top three ratings to English classes and Transportation.

2. Quality of food and of Wednesday P.M. seminars consistently received low ratings from the three groups.

3. Six out of the seven scientific trips received high ratings from the three groups. All those groups gave low ratings to the visits to the Kuwait Center of Agricultural Experimental Station.

4. All three groups ranked highly the seminars on Solar Energy and Islam and Science. However, reactions to the seminar on Scientific Approach varied among the three groups: Chemistry Students gave a high rating, while the two other groups gave low ratings. All three groups provided low rankings to the seminar on Economics.

B. Strength and Weaknesses of the Program

The strength of the 1981 Summer Training Program (SSTP) lies in its designed activities and organizational structure. Questionnaire and interview responses of students and staff indicate that the activities were varied enough to make it interesting to participants. The better than average attendance of participants, considering weather conditions of Kuwait, suggest that this project had something unique to offer to the students.

The organizational structure of the program under the direction of Dr. Nouria Al-Awadhi should be commended. The youthfull staff who provided support to Al-Awadhi in the program implementation is indicative of the strength of an emerging third world but rich country, with immediate needs for skilled technical manpower. The choice of a bright young Kuwaiti woman to manage this program in a country where the value of woman is just emerging, seems both commendable and appropriate. Al-Awadhi provided an appropriate role model for the female secondary students to emulate, and an unusual step for a middle eastern country to utilize the talents of a bright woman.

The following weaknesses of the program cited by better participants should be considered in planning future program:

- scheduling of selected activities
- lengthening of duration of the eight-week program
- need for mature supervisors with better than average management skills
- quality of food at KISR cafeteria

The overlap of this program with that of the college students according to Dr. Al-Awadhi, created severe logistic problems in the operation of the program for secondary students. Furthermore, general disatisfaction with the KISR computer center resulting from space problem; lack of on-line terminals, and lack of personn l to provide supervision, represented other shortcomings.

III. CONCLUSIONS AND RECOMMENDATIONS

The 1981 Summer Students' Training Program was effective in generating interest in science. Participants and staff alike were highly enthusiastic about the project. Program implementation funded under the aegis of Kuwait's three important institutions Kuwait Institute for Scientific Research (KISR). Kuwait University (KU), and Kuwait Foundation for the Advancement of Science (KFAS) - is indicative of the serious commitment of this country to the development of technical manpower.

If the long range goal of the 1981 SSTP program is to develop a local pool of scientists, engineers, trained technicians etc. it is critical that the interest of these participants be maintained and reinforced. This noble intent cannot be achieved in isolation and independent of local school involvement. Science teachers should be considered in planning any follow-up activities for these participants. Generating teacher interest in creative teaching of science is as important as, if not more important than, generating students' curiosity or interest in science.

Based on interviews and questionnaire responses of participants as well as interviews with staff. The following recommendations are offered to improve future program operation:

1. Continue to provide this type of program to high school students.
2. Extend program duration to allow participants complete their research projects.

3. Increase student participation to allow both "outstanding" and "average" students to participate in this unique program. The "outstanding" students will always make it with or without this program. The "average" students may get the most benefits from this type of a program.

4. Increase staffing to allow for increase student participation and increase staff - student ratio.

5. Hire mature supervisor with adequate management skills.

6. Revise schedule for selected program such as:

    . allocate mornings for lectures and afternoons for sports etc.

    . provide more time for lecture sessions and laboratory sessions.

7. Continue and increase the time period for English classes.

8. Recruitment and hiring supervisors should be based on demonstrated ability to exercise control or/and discipline, and the number of male and female students in the program.

9. Provide differentiated types of instruction on the basis of grade level and science courses taken at the high school.

10. Consider other research areas such as Biology, Geology etc.

11. Consider the offering of computer sessions and lectures at Kuwait University that will ensure:

    - Availability of supervisors

    - Availability of one-line terminals

    - Availability of space

IV. APPENDIX

TABLE A

PERCENT DISTRIBUTION OF MEAN RATINGS AND RANK ORDER BY GROUPING

Item	Physics & Electronics		Chemistry		Computer Science	
	$\bar{X}$	R.O.*	$\bar{X}$	R.O.*	$\bar{X}$	R.O.*
ACTIVITY						
Visits KISR Division	3.9	4	3.7	6	3.7	3
Orientation	3.0	6	4.3	3	4.3	2
English Classes	4.8	1	4.8	1	4.9	1
Chemistry/Physics	3.9	4	4.3	3	-	-
Science Films	3.7	5	4.3	3	3.5	4
KU Research Projects	4.6	2	4.8	1	-	-
KISR Computer Sessions	-	-	-	-	2.2	7
Scientific Trips	3.9	4	3.9	5	3.2	5
Sports	4.4	3	4.1	4	3.7	3
Lectures - Wed. p.m.	3.7	5	3.5	7	2.6	6
Food	2.8	7	3.3	8	3.2	5
Transportation	4.4	3	4.4	2	3.7	3
SCIENTIFIC TRIPS						
Telecommunications	4.2	1	4.5	1	3.3	5
KIA	4.1	2	4.3	2	3.2	6
Failaka Island	4.2	1	4.5	1	4.2	2
TV-Radio Complex	4.0	3	4.3	2	4.0	3
Criminal Research	4.2	1	4.3	2	4.8	1
MFD	3.8	4	4.0	3	3.8	4
Centre of Agri. Exptl.	1.8	5	2.8	4	2.0	7
SEMINARS						
Economics	1.9	8	3.0	5	2.7	7
Pollution	3.8	4	3.7	3	4.0	1
Solar Energy	4.3	1	4.2	1	3.8	2
Scientific Approach	2.1	7	3.7	3	3.0	6
Islam & Science	4.2	2	4.2	2	3.5	3
Kuwait Press	3.3	5	3.3	4	3.3	4
Kuwait Industries	4.0	3	4.4	1	3.2	5
Water Resources	3.0	6	4.2	2	2.7	7

* R.O.: 1 as the highest ranked item.

QUESTIONNAIRE RESPONSES (N=35)

. What did you learn?

Responses (N=89)	N=(%)
Increased knowledge and provided practical lab experiences.	32 (36%)
Improved English language grammar skills and increased scientific vocabulary	20 (22%)
Improved knowledge re: Scientific Approach	11 (12%)
Increased knowledge in Physics, Chemistry and Computer areas	10 (11%)
Use of Computers	3 (3%)
Others	13 (15%)

Science Films (1)

Picnics - should be integrated with learning (3)

Sports (1)

All activities enhanced scientific knowledge.

. List recommendations to improve the program

Responses (N=73)	N=(%)
Expand the program beyond 8 weeks to enable student complete projects at the research laboratories	19 (26%)

Revised schedule 14 (19%)

- schedule lectures in morings and sports in afternoons
- provide meaningful activity fillers for the 90 minute break on Wednesdays
- allocate more time for lectures and lab sessions during the five days, and less time for sports
- provide more time for the research projects at Kuwait University
- schedule more practice - oriented computer lectures in mornings

Increase number of participants 10 (13%)

Lengthen duration of English classes 7 (10%)

Improve the quality of food 16 (22%)

Others

Consider use of supervisors (4) with better management skills

Consider sex in the hiring of supervisors, e.g. 1 male, 1 female

Increase teaching staff

Provide more scientific trips that can be integrated with learning experiences

Broaden program emphasis beyond chemistry and Physics, e.g. Geology, Biology, math

Plan for meaningful activities to serve as time fillers

Maximize use of ethnic Arabs as lectures

Provide differentiated programs for 3rd and 4th year students

Allocate time within the week to allow visits to NSTIC an/or the University library